ABSTRACT

Anti-mine boots protect lower limbs of soldier, paramilitary and demining forces from accidental detonation of mine. These Anti-Mine Boots, which have blast reflecting and absorbing layers in the sole and minimize the physical damage to the lower limb. New design of Anti-Mine Boots involves new materials, in different layering pattern. These materials need testing in blast field environment as well as FEM simulation environment. FEM simulations reduced the mine field testing but for this validated material modal and material properties are required at high strain rate. Ceramic honeycomb structure has found importance, for its use in AMB for blast pressure attenuation. This thesis contributes to the development of methodology for finding the material modal and material properties of brittle ceramic honeycomb at high strain rate with validation check in mine blast experimental setup, for optimizing Anti-Mine boot design in thoroughly optimized FEM simulation environment.

Material properties of ceramic honeycomb is obtained through FEM inverse material mapping of SHPB experimental results. Material was modeled as linear brittle modal with failure stress and strain. Mine blast experiments were done to test the material alone and in sandwich structure form in blast environment and measured blast pressure was compared with FEM simulation result to draw the conclusion regarding ceramic honeycomb material use in design of AMB. All the parameters affecting output of FEM simulation were thoroughly investigated for valid simulation environment, with simulation of published mine blast experiments.